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REVIEW OF THE IMPLEMENTATION OF THE RECOMMENDATIONS AND DECISIONS ADOPTED BY THE GENERAL ASSEMBLY AT ITS TENTH SPECIAL SESSION

Letter dated 27 May 1982 from the Permanent Representative of Norway to the United Nations addressed to the Secretary-General

I have the honour to transmit herewith to Your Excellency a working paper stating the views of my Government on the verification of a comprehensive test ban.

I would be grateful if the working paper could be circulated as an official document of the twelfth special session of the General Assembly under item 9 of the provisional agenda.

(Signed) Tom VRAALSEN
Ambassador
Permanent Representative of Norway
to the United Nations

* A/S-12/10.

ANNEX

Working paper submitted by Norway

Verification of a comprehensive test ban

1. A comprehensive test ban is a cardinal measure for halting the nuclear-arms race. It would make a significant contribution to the aim of ending the qualitative improvement of nuclear weapons and the development of new types of such weapons and would constitute a non-discriminatory instrument of essential relevance to the promotion of non-proliferation.

2. The Tripartite Report to the Committee on Disarmament of 30 July 1980 a/ shows that some degree of progress has been made towards the important target of concluding such a treaty. Yet several technical issues connected with the verification of a comprehensive test ban remain. An adequate verification system is a necessary component in a comprehensive test-ban régime. The work being undertaken within the framework of the Committee on Disarmament is of special interest in this connexion.

3. Owing to the expertise and instrumentation provided by the Norwegian Seismic Array (NORSAR), Norway has been able to participate actively in the Ad Hoc Group of Scientific Experts to Consider International Co-operative Measures to Detect and Identify Seismic Events set up by the Committee on Disarmament. The Norwegian Government attaches considerable importance to the decision made at the closing of the first part of the 1982 session of the Committee on Disarmament to establish an ad hoc working group "to discuss and define, through substantive examination, issues relating to verification and compliance with a view to making further progress towards a nuclear test ban". b/

4. Since 1978, considerable progress has been made on the technical aspects of a system of verification. The seismic expert group has not, however, been able to consider all relevant technological advances which have been made in recent years and which should be taken into account in future work on the subject. In this connexion, as further explained in the appendix, it seems particularly important that:

(a) All stations in a global network should be equipped with modern digital recording devices;

(b) Computers with adequate capacity for handling the seismometer recordings should be installed and linked to an international communication system.

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a/ See CD/139/Appendix II/Vol. II, document CD/130.

b/ Official Records of the General Assembly, Twelfth Special Session, Supplement No. 2 (A/S-12/2), para. 38.

APPENDIX

Introduction

1. As is well known, underground explosions can only be detected by seismological means, as explosions like earthquakes generate acoustical waves which relatively easily can be recorded by seismographs thousands of kilometres away from the source. Owing to considerable and continued political interest in achieving a comprehensive test-ban treaty, much research effort has been invested in improving the seismological monitoring capabilities over the past 20 years. Recent advances in computer and communications technology have made it feasible in principle to incorporate sophisticated seismological analysis techniques in a monitoring context. The Committee on Disarmament's Ad Hoc Group of Scientific Experts to Consider International Co-operative Measures to Detect and Identify Seismic Events has recommended to the Committee on Disarmament the establishment of a global network of seismological stations to assist in verification of a potential comprehensive test-ban treaty. This Group has so far not been able to incorporate all recent technological advances relevant to such a global network.

The global seismograph network of the Committee on Disarmament

2. Primary information (Level 1 data) from this network (see figure) in terms of arrival times and amplitudes of seismic waves generated by earthquakes and/or nuclear explosions are to be transmitted to international data centres on an approximately daily basis.

3. The task of the data centres is to locate the seismic events on the basis of the above primary data, and then to distribute this information to participating States. For seismic events of particular interest, any participating State can request, via the data centres, copies of the original waveform recordings (Level 2 data).

Motivation for using modern technology

4. The rationale behind the desire to upgrade technologically the seismic monitoring system is that the ability to physically describe and correctly identify a seismic event (earthquake or underground explosion) is a function of the amount and quality of observations available. A practical advantage with such an upgrading is that the number of unidentified seismic events - where recorded signals could equally well come from an earthquake as from an explosion - would be much reduced.

5. The technological upgrading of the global network must start with its basic elements, the seismometers, and the following comments apply.

Digital seismometry

6. Traditionally, seismic waves are recorded by the seismometer in the form of analogue traces on photographic paper, and similar means. Only in exceptional

cases is use made of digital recordings, that is, automatic reading of trace amplitudes at close, fixed time intervals. The advantage of digital recording systems is that the data can be fed directly into a computer or microprocessor for automatic and comprehensive analysis. In this way, the occasional subjective judgement of human analysts can to a large extent be eliminated. Digital recording units which required elaborate and costly recording systems in the 1960s are now generally available at very moderate cost.

7. Computer and microprocessor systems usually are equipped with devices for temporary data storage which easily can handle many hours of recordings from a seismograph station. This will be most useful for transmitting the primary (or Level 1) data to the international data centres, as the computers at the individual seismograph stations can be instructed to dial-up via the international telephone network computers at the international data centres and then automatically transfer Level 1 data at specific time intervals. Limited experiments conducted in Norway clearly imply that this way of transferring data is both practical and reliable.

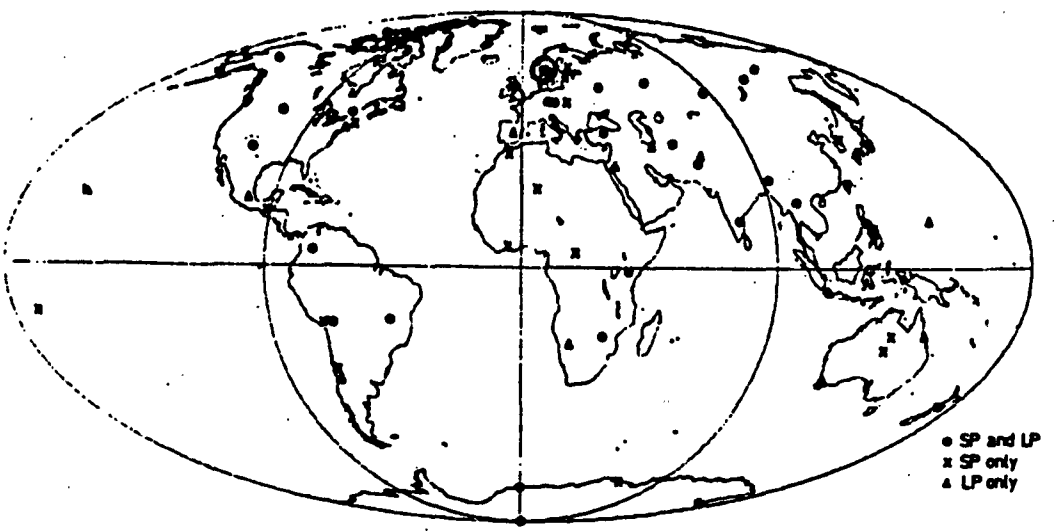
Extension of the Level 1 data concept

8. As mentioned, the Level 1 data are used in the data centre for seismic event location purposes. If this information is limited to time and amplitude parameters, only the location analysis techniques to be used will be on the same level of sophistication as those used in the 1960s. However, if waveform data are available, recent theoretical advances in seismology can be exploited for a more comprehensive description of the seismic event in question on a routine basis. The extension of the Level 1 data concept to occasionally include waveforms can very easily be handled by modern telecommunication systems generally available.

Exchange of Level 2 data

9. The task of classifying seismic events as either underground explosions or natural earthquakes is the responsibility of the individual States parties to a comprehensive test-ban treaty. For most events this problem is rather trivial, but for complicated ones extensive waveform (Level 2) data are needed for resolving the event classification (identification) problem. Requests for Level 2 data are to be handled by the international data centres and the "delivery" time involved, using the postal system, would be of the order of two to four weeks. Several States consider this response time inadequate, in particular as modern communication technology would permit rapid exchange (within a few days) of even very extensive Level 2 data requests. In most cases such digital data can be exchanged via commercially available communication networks like the international telephone network, dedicated data links or special-purpose satellite transmitters for remotely located seismograph stations.

Figure



The seismic expert group established by the Committee on Disarmament has proposed a global seismic network to assist in verifying a Comprehensive Test Ban Treaty. The stations in this network are shown on the figure, and the NORSAR array is marked with a circle. SP and LP are abbreviations for short and long period seismometers, respectively.
